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**END SEMESTER REGULAR / RETEST
EXAMINATION, JULY-2023**

Branch : Chemical Engineering

Semester : 4th (New)

Subject Code : Ch-403

FUEL, FURNACE AND REFRACTORIES

Full Marks – 70

Time – Three hours

The figures in the margin indicate full marks
for the questions.

Instructions :

- (i) *All* questions of PART-A are compulsory.
- (ii) Answer any *five* questions from PART-B.

PART – A

Marks – 25

1. Choose the correct answers : $1 \times 5 = 5$
- (a) Characterization of paraffinic crude is
- (i) equal to or less than 12
 - (ii) equal to or greater than 12
 - (iii) equal to or greater than 10
 - (iv) equal to 5

[Turn over

(b) Uranium-235 is an example of

- (i) by-product fuel (ii) nuclear fuel
- (iii) chemical fuel (iv) fossil fuel

(c) Colour of crude is

- (i) from light brown to dark brown
- (ii) blue
- (iii) from light blue to dark blue
- (iv) red

(d) Main purpose of carbonization is to produce

- (i) Coal (ii) Coke
- (iii) Petrol (iv) Diesel

(e) Main constituents of producer gas is

- (i) CO , N_2 (ii) H_2 , CO_2
- (iii) O_2 , NO (iv) C , NO_2

2. Fill in the blanks :

$1 \times 10 = 10$

(a) Cleaveland apparatus is _____ cup.

(b) In lignite coal, % of carbon is _____.

- (c) Combustion rate of coal can be _____ by pulverization.
- (d) % of hydrogen in crude oil is _____.
- (e) Cloud point is the important property of _____.
- (f) _____ desalter is more efficient and economical.
- (g) Natural gas is a mixture of _____ hydrocarbons.
- (h) In furnace, there is _____ to retain heat at high temperature.
- (i) Fire clay is an example of _____ refractory.
- (j) Wind energy is an example of _____ energy.

3. State True or False :

$1 \times 10 = 10$

- (a) Petroleum is an example of renewable energy.
- (b) Dolomite is an example of basic refractory.
- (c) Furnace efficiency does not depend on flame temperature.
- (d) Water gas is used as a fuel in furnace.

- (e) Product taken out from the side of distillation column are called draw off.
- (f) Reboiler maintains the top temperature of a distillation column.
- (g) Temperature of low temperature carbonization is 11,000 Centigrade.
- (h) Ash content is low in coal.
- (i) Geothermal energy is heat derived within the sub-surface of earth.
- (j) Combustion of CNG is more regular.

PART – B

Marks – 45

4. Write short notes on : 3×3=9
- (a) Anilene point
 - (b) Cracking
 - (c) Base of crude.
5. (a) Explain the theories behind the origin of coal. 4
- (b) What do you mean by rank of coal ? Classify coal on the basis of rank. 5

6. Describe two stage distillation operations of crude with suitable diagram. 9
7. (a) What do you mean by nuclear energy ? Give examples. 3
- (b) Distinguish between renewable and non-renewable energy. 3
- (c) Explain Solar energy with uses. 3
8. Describe the manufacturing process of producer gas with diagram. 9
9. (a) Describe the construction, operation and uses of Muffle furnace. 6
- (b) What are the factors affecting the economy of a furnace ? 3
10. (a) What are the basic properties of a refractory ? 4
- (b) Explain the manufacturing process of silica refractory with uses. 5